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LIMINARY COMMUNICATION.

BY

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LONDON, ENG.

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ON REFLEX CONTRACTION OF MUSCLES ASSOCIATED WITH PULMONARY DISEASE.

PRELIMINARY COMMUNICATION.

By EDGAR F. CYRIAX, M.D.,

LONDON, ENG.

I HAVE read with great interest the papers by F. M. Pottenger¹ that have recently appeared on the subject of spasm of the chest muscles, particularly his remarks on spasm of the intercostals regarded as a physical sign of disease of the lungs. Pottenger states that as far as he is aware this symptom, excepting as occurring in pleurisy, has not been hitherto described. I must, however, beg to point out that in the year 1903 it was briefly described by myself in a volume entitled "The Elements of Kellgren's Manual Treatment."² This work expounded the Ling system of medical gymnastics, with special reference to the modifications and improvements introduced by H. Kellgren.

Quoting from this work, there occurs on page 163 the following: "In the abdomen reflex contraction of the muscles of its wall are frequently found as a result of irritative or inflamed conditions of organs in its cavity. The same state of matters obtains with the thorax; reflex contractions of the intercostal muscles result from many morbid conditions of the lungs, bronchi, and pleura." On page 312, in the course of a description on the treatment of acute croupous pneumonia, there further occurs:

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“* * * The impediments to respiration that lie in the muscular apparatus. These are found to be: contractions in the intercostal muscles over the affected lobe or lobes, deficient action of the diaphragm, with or without marked contraction of the abdominal muscles.” On page 314 it is mentioned that in a case of lobar pneumonia affecting the left lower lobe there was contraction of the fifth to ninth intercostal spaces. And lastly, on page 313 is the following: “In two cases of pneumonia that I have treated, the kidney region of the affected side was much more tender to touch than that of the opposite side.”

While it gives me great pleasure to agree in the main with Pottenger's remarks and observations, I nevertheless desire to supplement the same with certain of my own. I have specially kept under observation the reflex contraction of muscles mentioned, inasmuch as they tend to aggravate diseases of the respiratory organs by rendering respiration more difficult, and this frequently to a most marked extent. One of the objects of the Swedish manual treatment, and one which has consistently been held in view and worked out by H. Kellgren, is the removal of these impediments to respiration by means of such manipulations as stationary and running vibrations of various kinds, light frictions (to be briefly described below) and so on. It is indeed largely through these manipulations (aided, of course, by the patient voluntarily practising deep respiration) that the Swedish manual treatment can effect such great alleviations and often rapid cures, not only of chronic conditions, but even of acute ones, such as lobar pneumonia, bronchitis, etc.

Let me first briefly describe the *modus operandi* of testing for these reflex contractions of muscles that occur in connection with pulmonary disease:

(1) Intercostal muscles. I entirely agree with Pottenger that "the best way is to palpate by gently pressing the tips of the fingers into the intercostal spaces and moving the hand sideways while noting the degree of resistance." (2) Erector spinæ muscles. The patient is placed in a position in which these muscles are relaxed, *i. e.* he either lies on his back or, if more convenient, on his face. The hand of the manipulator is placed so that its long axis lies at right angles to the vertebral column; the fingers are placed on one side of the erector spinæ and then, applying a certain amount of pressure at the same time, are drawn across that muscle in much the same way as the player sets a harp string in vibration. Normally a dull kind of "click" of the muscle will result; it can be clearly felt and is audible to a slight extent. If any portion of it is contracted there will be felt quite a different sensation of resistance, the "click" will be quicker and sharper, and the patient will experience a pain instead of a pleasant stimulatory sensation. Mere palpation will not enable the manipulator to define the size and degree of this contraction of muscle with anything like the certainty that results from executing a sharp friction across the mass of muscle. (3) Diaphragm. The respiratory excursion during ordinary and deep respiration and the amount (if any) of the retraction of the abdomen and participation of the abdomen, specially in its upper part, will serve as guides. (4) Anterior abdominal muscles. Palpation of these is generally at once sufficient to reveal contraction in them; irritability to touch is also a guide to some extent. Breathing exercises will also aid in determining whether these muscles are exerting their proper actions. (5) Cervical muscles. As mentioned by Pottenger, palpation is generally quite sufficient. (6) Pectoral muscles. Palpation or roll-

ing the muscles between the thumb and fingers, as mentioned by Pottenger, will determine whether they are contracted or not.

The following is a brief list of some of the contractions that most commonly occur, together with a few critical observations:

Pulmonary Phthisis.—This condition is accompanied by contraction of the following muscles, dependent, of course, upon the site and extent of the lesion: (1) Intercostal muscles. This has been entered into in considerable detail by Pottenger, who states: "While rigidity affects all the muscles of the chest, yet it is found in greatest degree in the intercostals." I have not always found this to be the case, as sometimes there may be no contraction in the intercostals, yet a marked one in the (2) erector spinæ. Isolated slips or the whole breadth of this group of muscles may be contracted. I have in some cases, where both erector spinæ and intercostals were contracted, executed a series of frictions over the erector spinæ and their nerves of supply; the result was practically immediate; within fifteen seconds or so there occurred relaxation of the intercostal muscles, the contraction of the erector spinæ, however, remaining unchanged. While agreeing with Pottenger that the resistance of the intercostal muscles apparently disappears in advanced cases of phthisis, I would point out that the slips of the erector spinæ frequently behave in the same manner. Pottenger considers that the apparent disappearance of the intercostal rigidity is due to the removal of the supporting tissue. Whether this is true or not in the case of the intercostals, it cannot hold good for the erector spinæ; here the disappearance must be a real one. (3) Diaphragm. Two conditions are met with: (a) A kind of reflex inhibition; (b) a perverted action, in which the muscle which pre-

viously acted normally, now rises with inspiration and sinks with expiration. An apparent difficulty in using the diaphragm may be due to contraction in the anterior abdominal muscles which do not allow it to descend. Contractions of the diaphragm may exist in phthisis pulmonum before any other muscles are similarly affected. (4) Pectoral muscles. Irritability to percussion has long been considered a symptom of pulmonary phthisis. (5) Certain cervical muscles (as mentioned by Pottenger). In this connection it is of interest to quote the experiments of Boeri.³ He found in cases of phthisis incipiens that if no abnormal breath sounds over the apex could be elicited on auscultation, yet these sometimes became audible after a few minutes' deep massage over the apex of the lung. This may have been due to removal of muscular spasm causing the excursion of the apex to increase, though Krusenstern,⁴ who reinvestigated this phenomenon, concluded that it was due to mechanical irritation of the phrenic nerve causing the diaphragm to act more efficiently. (6) Serratus magnus. This muscle is sometimes contracted, and its combined action with the pectorals seems to be the cause of the scapulæ being pulled round the side of the chest. In some cases I have seen the serratus magnus contracted, but not the pectorals. (7) Anterior abdominal muscles. Contractions here are frequent. In some cases, as already stated, they are the cause of the diaphragm not being able to descend; if the contraction in them is removed by gentle petrissage or other manipulation, the diaphragm is at once able to contract properly.

Acute Croupous Pneumonia.—This disease is almost always accompanied by the following contractions: (1) Intercostal muscles. The intercostal muscles that lie over the affected lobe or lobes are

nearly always markedly contracted throughout their entire length. If pleurisy happens to be present it tends to increase the rigidity. (2) Diaphragm. Although generally bilateral, one sometimes meets with unilateral contraction of this muscle, and in this case, as would be expected, it is on the same side as the affected portion of the lung. Inability to breathe deeply, using the diaphragm, is very frequent in lobar pneumonia; this is partly due, if the base is affected, to the solid lung preventing the excursion of the muscle, but in some cases it must be reflex, as I have observed it in a case of apical pneumonia. (3) Erector spinæ. Generally the muscles on the side of the affected lobe are involved, and the contraction extends throughout their whole breadth. In pneumonia of the lower lobe it sometimes extends downward to the sacrum, *i. e.* the whole lumbar portion is affected. On the other hand, above the limit of the inflammation the contraction nearly always ends abruptly. (4) Cervical muscles. I have seen these contracted in cases of apical pneumonia. (5) Anterior abdominal muscles. These may also be affected, and in some cases unilaterally on the side of the inflammation. In pneumonia the contraction of some of the above-mentioned muscles is sometimes well marked before the signs of pneumonia are established, as the following case² will show: K. S., male, aged 33, had a rigor on March 27, 1900, and suddenly became very ill. March 28th, morning, temperature 104.9°, pulse 140; evening, 104.2° and 120, respectively. Nothing abnormal in the lungs during the morning. March 29, morning, temperature 105.5°, pulse 120; evening, 106° and 112, respectively. There was, during the morning, contraction of the fifth to ninth intercostal spaces on the left side; over the left lower lobe, however, was found only a moderate amount of percussion

dullness, and the breathing was harsh vesicular with fine crepitations. March 30: The dullness now was absolute, and there was present tubular breathing with no crepitations unless very deep inspiration was taken; vocal fremitus and resonance were markedly increased. The contractions in the intercostals, anterior abdominal muscles, and diaphragm disappeared coincidently with the crisis in every case that I have observed; in one case of delayed crisis they disappeared only slowly. Removal of the muscular contractions by the mechanical process of frictions over the affected erector spinæ and the nerves supplying them, and vibrations along the intercostal spaces, will frequently change the nature of the breath sounds as determined by auscultation, due no doubt in great part to the air coming in and out of a partly movable instead of a very or quite unmovable lobe.

Acute Bronchitis.—In this condition one does not find so many reflex contractions as in the two foregoing. Generally the only ones met with are: (1) The upper intercostal muscles (second to fourth) are frequently contracted. (2) The diaphragm is often affected in one of the two ways as mentioned under the head of pulmonary phthisis.

How do these contractions arise? As regards the intercostal muscles and the erector spinæ, the obvious channel is through the sympathetic nerves of the lung, the remi communicantes, and the spinal nerves. The anterior abdominal muscles are also affected through the same channel, and this is the reason why the lower portion of the abdominal muscles, which are supplied by nerves that communicate with sympathetic ganglia below the lower limit of the lung, do not always undergo contraction so markedly as the upper portion. As regards the diaphragm, it is not so easy to determine the chan-

nel. This muscle has a nerve supply from the phrenics, the intercostals, and the sympathetic, either of which group may be affected. The phrenic may be directly influenced from contiguity to the lung, and this may produce direct or reflex effects on the diaphragm.⁵ Similarly, involvement of the fibers of the vagus in the lungs may play a part; it must be remembered that the vagus is intimately connected with the sympathetic in the lungs, the two forming together the anterior and posterior pulmonary plexuses; also that a neuritis of the vagus has been found in advanced phthisis. The contraction in the serratus magnus is probably due to the irritation of the intercostal nerves; this may also partly explain the cause of the contractions in the pectorals. The precise channel of the contraction of the cervical muscles is not quite so easy to determine, as there are so many possibilities.

In this brief paper I have added as much as is at present necessary to the consideration of reflex contractions of muscles in affections of the pulmonary organs. I trust that it will not be long before Pottenger will be able to communicate to the profession further experiences of his own as regards this most interesting topic, and aid in clearing up the points that are as yet not so thoroughly understood.

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